GENERAL WELDING SAFETY: Respiratory Hazards

Hot work operations, including welding, pose a number of respiratory health hazards. Most welding at University locations will involve either a gas flame or an electrically generated arc. In addition to the general hazards listed on page 1, each operation must be evaluated for the specific hazards it may pose. Hazards depend on the type of welding, the types of materials (listed on page 2), and the welding work practices being used.

HAZARD	SAFETY MEASURES
Fumes and gases produced by the welding process can be dangerous to your health. Common welding fumes created during steel work include oxides of iron, manganese and silicon. Stainless steel may create more harmful exposures. Short-term exposure can produce burning of eyes and skin, dizziness, nausea or fever. Long-term exposure may lead to irreversible lung damage.	Use enough **ventilation** or exhaust to keep fumes to a minimum and do not breathe them. Any welder who feels **dizzy or nauseated** may be overexposed to one or more of these compounds and should stop welding immediately and get fresh air. If the symptoms do not go away, seek medical attention. **Respiratory protection** or use of other controls is required if exposures to metal fumes exceed regulatory limits. An evaluation by an industrial hygienist may be required to ensure welding operations are safe.
Coatings on the metals being welded may contain toxic substances such as lead, chromium or zinc.	Whenever possible, **remove any coatings** on metal prior to welding operations.
In **arc welding**, the composition of the electrode may contribute to the fumes released. The electrode should come with a Safety Data Sheet listing the materials used to create it.	Some electrodes require **special ventilation**, such as stainless or hard-facing products. Be sure to keep exposures as low as possible in these situations.
Welding operations that emit ultraviolet radiation, such as **carbon-arc welding**, **gas tungsten-arc welding (GTAW or "TIG"**) and **gas metal arc (GMAW or "MIG")** welding can produce ozone and nitrogen oxides. These can irritate the eyes and lungs, and can cause headaches and chest pain. UV radiation may break down degreasing compounds, thus increasing exposures.	Whenever possible, perform welding in an **unconfined, well-ventilated area**. **Avoid using chlorinated hydrocarbon degreasers** like TCE. **Respiratory protection** or use of other controls is required if exposures to welding gases and by-products exceed regulatory limits. An evaluation by an industrial hygienist may be needed to ensure welding operations are safe.
Welders are often exposed to **metal fumes** released during welding operations. An illness related to these fumes, termed *metal fume fever*, has symptoms similar to the common flu. These include fever, chills, nausea, headache, fatigue, joint pains and chest pains.	**Respiratory protection** or use of other controls is required if exposures to metal fumes exceed regulatory limits. An evaluation by an industrial hygienist may be needed to ensure welding operations are safe.

HEALTH HAZARDS AND EXPOSURE SYMPTOMS ASSOCIATED WITH SPECIFIC MATERIALS USED IN WELDING

Barium: Severe stomach pain, slow pulse rate, irregular heartbeat, ringing of the ears, convulsions and muscle spasms, even death.

Beryllium: Shortness of breath, chronic cough, weakness and fatigue, especially with prolonged exposure. Exposure can cause allergic-like symptoms, followed by chronic lung disease. Can also cause acute lung disease and cancer.

Cadmium (used in plating, silver solder): Fever, chills, nausea, headache, fatigue, joint pains and chest pains; symptoms similar to metal fume fever. Symptoms appear quickly and exposure can be fatal. Can cause significant kidney damage and is suspected to cause cancer

Chromium (found in stainless steel and hard-facing consumables): Exposure can result in lung cancer and asthma. Local exhaust and respirators may be required.

Cobalt: Exposure can result in respiratory disease, pulmonary sensitization lung damage.

Copper: Exposure can result in metal fume fever, skin irritation, discoloration of skin and hair.

Fluoride: Exposure can cause abdominal pain, diarrhea, muscular weakness and convulsions. Extreme cases may cause loss of consciousness and death. Repeated exposures may cause calcification of the bone, ligaments, ribs, pelvis and spinal column. Long-term exposure may cause a skin rash.

Manganese: Exposure affects the central nervous system, resulting in poor coordination, difficulty speaking, and tremor of the arms or legs. This condition may be irreversible. It can also cause metal fume fever.

Nickel: Exposure poses a cancer risk, and may cause skin irritation and dermatitis. Many individuals become sensitized to nickel; their allergic skin reactions can worsen.

Silica: Can cause severe lung damage (silicosis).

Zinc: Exposure to its oxides is the most likely cause for metal fume fever

Contact EH&S at 206.685.0341 for consultation or evaluation.